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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/871,039	05/31/2001	Kevin Colbow	13145US01	9017

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Robert W. Fieseler
McAndrews, Held & Malloy, Ltd.
500 West Madison Street, 34th Floor
Chicago, IL 60661

EXAMINER

WINTER, GENTLE E

ART UNIT	PAPER NUMBER
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1746

DATE MAILED: 07/27/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/871,039	Applicant(s) COLBOW ET AL.	
	Examiner Gentle E Winter	Art Unit 1746	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 June 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-21 and 31-39 is/are pending in the application.
- 4a) Of the above claim(s) 31-39 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) 1-21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. Non-elected claims 22-30 are cancelled.
2. Newly submitted claims 31-39 are directed to an invention that is independent or distinct from the invention originally claimed for the following reasons:
3. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 1-21, drawn to a method, classified in class 429, subclass 19.
 - II. Claims 31-39, drawn to a method, classified in class 429, subclass 13.
4. The inventions are distinct, each from the other because of the following reasons:
5. Inventions I and II are unrelated. Inventions are unrelated if it can be shown that they are not disclosed as capable of use together and they have different modes of operation, different functions, or different effects (MPEP § 806.04, MPEP § 808.01). In the instant case, the different inventions are not disclosed as capable of use together and they have different modes of operation, different functions, and different effects. Specifically, claim 1 is drawn to a method of improving fuel cell performance, while claim 31 is drawn to a method of providing power to a load.

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6. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

7. Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 31-39 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Response to Arguments

8. Applicant's arguments filed 4 June 2004 have been fully considered but they are not persuasive. The Remarks indicate that Wilkinson, taken in context fairly teaches, "power production falls *within* the contemplated operating range, not below it" (emphasis added). The Remarks indicated that the Wilkinson reference does not teach "reduction of the output power to a level below the operating range." The Remarks rely on the proposition that "Wilkinson et al. do not disclose that the power output drops below the operating range." If, *arguendo*, the position is accepted the structure and steps are identical to those claimed. The arbitrary and capricious designation of a value being outside an operating range is simply a matter of semantics. What constitutes the value? 10% of the standard operating conditions? Maybe 15%? Or 0%? The expression "normal minimum output" is susceptible to a variety of readings, and occurs every time the load is eliminated from every cell and when the cell is shut down. Additionally, since the steps are disclosed to be identical, it follows that the result is identical.

9. The Remarks summarize the traversal to the Wilkinson rejection by arguing that Wilkinson et al. disclose a method of operating a fuel cell in which a portion of the anode is periodically fuel starved, while the output power remains in an operational range. The remarks continue:

Applicants and Wilkinson et al. have opposite objectives, and therefore satisfy their respective objectives using different processes. It is respectfully submitted that Wilkinson et al. do not anticipate the invention recited in claim 1. Claims 2-15 depend from claim 1, and therefore also cannot be anticipated by Wilkinson et al. The rejection of claims 1-15, therefore, should be withdrawn.

10. As an initial matter, the argument is flawed, Wilkinson and the recited claims are drawn to doing the same thing, the same way--improving fuel cell performance, through periodic starvation--see "improved cell performance" (Wilkinson Abstract) by periodic starvation at the anode (see title. The Remarks argue that the Wilkinson system is geared to providing a constant output. If the anode is starved, the output will drop, the prior art teaches this and applicant claims this. The rejection is maintained.

11. As to claims 16-21, the Remarks argue that the Wilkinson's stated goal is to starve the fuel cell while interrupting the power output. Lyons teaches a switch that is rapidly opened and closed. Initially, it is noted that switches are perhaps the single most common single component provided with fuel cells, next to the fuel cell itself. Additionally, Lyons conducts his rapid switching to, in effect; allow an uninterrupted supply of power. It is also noted that the present claims do not preclude the concept of using the inventive concept in a bank of fuel cells such that the power output is substantively constant.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

12. Claims 1, 2, 5, 6, 7, 8, are rejected under 35 U.S.C. 102(a) as being anticipated by United States Patent No. 6,096,448 to Wilkinson et al. (Wilkinson).

13. With respect to claims 1, 6, and 7 disclosing a method of improving the performance of a direct feed fuel cell. The same is disclosed at e.g. column 3, line 15 *et seq.* Claim 1 further goes on to indicate that the direct feed fuel cell has an anode comprising a CO-tolerant catalyst. In claims 6 and 7 the CO-tolerant catalyst is disclosed as platinum-ruthenium catalyst, the same is disclosed at column 12, line 10 *et seq.* Claim 1 goes on to indicate that the direct feed fuel cell includes a solid polymer electrolyte and a cathode. The same is disclosed at column 3, line 15 *et seq.* Claim 1 further indicates that the fuel cell is normally outputting power in a range from a minimum to a maximum output, comprising the steps of: providing a supply of fuel to the anode for the oxidation of the fuel to produce an oxidation product and electrons at the anode; providing a supply of oxidant to the cathode for reduction of the oxidant, thereby producing a reduction product; and reducing the output power of the fuel cell at predetermined time intervals to be less than the normal minimum output. The same is disclosed at column 2, line 65 *et seq.* describing, “fuel starving”, and associated relevant drawing showing the associated output drops.

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14. As to claims 2, disclosing that the output power of the fuel cell is periodically reduced at predetermined time intervals for 0.5-second durations at 5-second intervals. The same is disclosed in Wilkinson at column 11, line 43 *et seq.*

15. As to claim 5, disclosing that the normal maximum output and the normal minimum output is in a ratio of up to 60:1. This is inherent in the above-described fuel cell, which is indistinguishable from the claimed fuel cell. It is also noted that Applicant, quite correctly points out: "Typically, the ratio of the maximum power output to that of the minimum power output (or "turndown ratio") for such a fuel cell system is less than about 60."

16. As to claim 8, disclosing that reducing the output power of the fuel cell is effected by reducing the output current from the fuel cell at predetermined time intervals. The same is disclosed at column 3, line 19 *et seq.* Starving the cell of fuel will reduce the output of the current.

17. As to claim 9, disclosing that the output power is provided to an external circuit, the circuit being switchable between a closed circuit condition in which the flow of electric current is permitted and an open circuit condition in which the flow of electric current is interrupted and wherein reducing the output power of the fuel cell is effected by switching the circuit to the open circuit condition at predetermined time intervals. The same is disclosed at column 5, line 51 *et seq.* Specifically, Wilkinson discloses a switch that "periodically momentarily electrically connects the transient electrical load to draw electrical power from the fuel cell."

18. As to claim 10, further limiting claim 9 and disclosing the step of interrupting the supply of fuel to the anode at predetermined time intervals when the output power of the fuel cell is reduced. The same is disclosed at column 5, line 39 *et seq.* Disclosing a “flow controller for periodically introducing pulses of the substantially fuel-free fluid into the fuel stream upstream of the fuel cell anode. The flow controller may comprise an interrupt valve for controlling the introduction of the substantially fuel-free fluid stream into the fuel stream.”

19. As to claim 11, further limiting claim 9 and disclosing the step of interrupting the supply of oxidant to the cathode at predetermined time intervals when the output power of the fuel cell is reduced. The same is disclosed at column 5, line 39 *et seq.* disclosing, “the interrupt valve may be fluidly connected to an oxidant stream outlet of the fuel cell.”

20. As to claim 12, further limiting claim 9 and disclosing that the cathode comprises platinum as catalyst. This feature is believed to be inherent; it is well known in the art that, solid polymer fuel cells commonly employ a platinum catalyst at the cathode and a platinum-ruthenium catalyst alloy at the anode. Nonetheless, Wilkinson discloses that the cathode comprises a platinum alloy catalyst. See column 14, line 54 *et seq.*

21. As to claim 13, further limiting claim 9 and disclosing that the fuel comprises methanol, the same is disclosed at column 3, line 61 *et seq.*

22. As to claim 14, further limiting claim 13 and disclosing a liquid aqueous methanol solution the same is disclosed at column 3, line 61 *et seq.*

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

23. Claims 3, 4, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over United States Patent No. 6,096,448 to Wilkinson et al.

24. As to claims 3 and 4, further limiting claims 2 and 3 respectively, and disclosing that the output power of the fuel cell is periodically reduced at predetermined time intervals and the predetermined time intervals are from about 0.5 hours to about 4 hours and with specific respect to claim 4, about 30 minutes. Each and every limitation of claims 3 and 4 are disclosed in Wilkinson as set forth above, except that Wilkinson fails to explicitly disclose that the output power is of the fuel cell is reduced for about 30 minutes. Since reduced has been defined in the specification as including opening the load circuit. Wilkinson discloses the desirability and provides the motivation for adjusting both the frequency and duration of the interruptions see e.g. column 7, line 41 *et seq.* Specifically, Wilkinson discloses:

[T]he interruptions may be spaced at fixed time intervals or variable time intervals which are adjusted according to factors such as, for example, the concentration of poisons to which the anode electrocatalyst is exposed, and the configuration of the flow field. For example, for fuel cells subjected to lower poison concentrations, it is possible to lengthen the intervals between periodic fuel supply interruptions.

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25. Wilkinson, however does not disclose specifically disclose “about half an hour” as the required interval. Thus, Wilkinson discloses the claimed invention except for indicated time interval. It would have been obvious to one having ordinary skill in the art at the time the invention was made to select about 30 minutes to four hours since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). Wilkinson says as much at column 7, line 41 *et seq.*, as set forth above, disclosing: “With respect to frequency, the interruptions may be spaced at fixed time intervals or variable time intervals which are adjusted according to factors such as, for example, the concentration of poisons to which the anode electrocatalyst is exposed, and the configuration of the flow field.” And continues: “For example, for fuel cells subjected to lower poison concentrations, it is possible to lengthen the intervals between periodic fuel supply interruptions.” And at column 4, line 41, Wilkinson discloses: “[T]he method may comprise monitoring an operational parameter of the fuel cell and adjusting the frequency with which the momentary fuel starvation is induced in response to the value of the monitored parameter. Similarly, the duration of the momentary fuel starvation may be fixed or varied, for example in response to a monitored operational parameter.” Thus explicitly providing the motivation for adjusting the time period. In a larger sense, the cell would almost certainly be turned off for intervals ranging for ½ to 4 hours.

26. As to claim 15, further limiting claim 9 and disclosing that the circuit is switched to the closed position for a period of greater than about 30 minutes. Virtually every fuel cell that was shut off for at least 30 and restarted, at least once. Consider a fuel cell in a commuter vehicle.

27. Claim 16-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over United States Patent No. 6,096,448 to Wilkinson *et al.* and United States Patent No. 3,300,345 to Lyons *et al.* (Lyons). As to claim 16, further limiting claim 9, each and every limitation of claim 16 is disclosed in Wilkinson as set forth above, except that Wilkinson fails to explicitly disclose that the circuit is switched to the open position for a period of less than about 30 seconds. Any time less than 30 seconds would suffice. Column 4, line 36 discloses interrupting the circuit 182 times a second. Lyons further discloses 3 cycles (on/off) per second at column 5, line 3 *et seq.* The artisan would have been motivated to make the combination at the time of the invention for the reasons explicitly set forth in Wilkinson, namely removal of electrocatalyst poisons from the anode.

28. As to claim 17, further limiting claim 9 and disclosing that the step of reducing the output power of the fuel cell at predetermined time intervals comprises the steps of: operating the cell to provide electric current in the circuit for an operating period of about 0.5 to 4 hours; opening the circuit to terminate the flow of electric current for a rest period of about 1 second to 30 minutes column 6, line 38 *et seq.* and ramping the current to increase from zero to a working value for a ramping period of up to 5 minutes. Again, it is noted that “up to 5 minutes” includes any value less than five minutes. The figures 4-8 demonstrate the disclosed “ramping”. It is noted that the claim does not disclose a “variable load” as disclosed in column 5, line 34 *et seq.* of Lyons. Additionally, it is noted that Wilkinson discloses a capacitor. The ramping is disclosed to result in a longer life for the electrode.

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29. As to claim 18, further limiting claim 17, and disclosing that the operating period has a duration of greater than about 30 minutes. Most automotive fuel cells are operated for more than about 30 minutes. The artisan would have been motivated to operate a fuel cell for more than 30 minutes because shutting a fuel cell down usually requires an inert-gas electrode-blow-off, and because the artisan would need power for a period exceeding 30 minutes.

30. As to claim 19, further limiting claim 17, and disclosing that the rest period has a duration of less than about 30 seconds. This is identically disclosed in Lyon and Wilkinson. A shorter duration, but effective period allows for greater power density. See column 12, line 9 *et seq.*

31. As to claim 20, further limiting claim 17, and disclosing that the ramping period has a duration of less than about 2 minutes. As indicated above, a results effective period would be selected. Less than one second is disclosed, in *inter alia* Wilkinson in figure 8 and relevant associated text and at column 5, line 53 *et seq.* discussing a “transient electrical load” to draw power from a fuel cell.

32. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wilkinson, Lyons, and of PGPub US 20020083640 to Finkelshtain. Claim 21, further limiting claim 17, and disclosing that the ramping period has a duration of greater than about 10 seconds. This would inherently occur as the cell is pressed into service, draw is ramped as a function of the cells’ capacity to meet the demand resulting from the load. This is illustrated in figure 3A of PGPub US 20020083640.

Conclusion

33. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

34. A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

35. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gentle E Winter whose telephone number is 571-272-1310. The examiner can normally be reached on Monday through Friday 7AM-4PM.

36. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Barr can be reached on 571-272-1414. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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37. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Questions on access to the Private PAIR system should be directed to the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Gentle E. Winter
Examiner
Art Unit 1746

July 21, 2004


BRUCE F. BELL
PRIMARY EXAMINER
GROUP 1746